Mine Closure 2025 – S Knutsson, AB Fourie & M Tibbett (eds)
© 2025 Australian Centre for Geomechanics, Perth, ISSN 2208-8296
doi:10.36487/ACG_repo/2515_32

Repurposing of mine infrastructure at closure

David Saiang [a,*], Wilfred Lus [b]

[a] *Department of Civil, Environmental and Natural Resources Engineering, Luleå University of Technology, Sweden*

[b] *World Bank Group, Papua New Guinea*

Abstract

The repurposing of mine infrastructure should be considered an essential part of mine closure planning. In many underdeveloped countries, mines usually have the most well-developed infrastructure, from energy infrastructure to social infrastructure. The host governments of these countries often lack the ability to utilise this infrastructure after mine closure. Due to the need for sustainable and responsible mining, some mining companies have started to take it upon themselves to plan how the mining infrastructure can be repurposed after mine closure. This paper presents one such example, where the mining company developed the concept of integrated infrastructure to service both the mine and the civil society during both the operational and closure phases of the mine. Located in one of the harshest environments on Earth, with high rainfall, rugged terrain and high seismicity, dedicated mine waste storage infrastructure was planned for the Frieda River Copper-Gold Project in Papua New Guinea. The purpose of the infrastructure, coined by Xstrata PLC as an 'integrated storage facility', is to serve as massive underwater storage for the mine waste. At the same time, it was developed to utilise the cover water to generate electricity for the mine and the region, with potential to export access power across borders. Even though challenging and ambitious, the concept remains to be further explored both technically and fiscally, as it has the potential to be of significant economic benefit for Papua New Guinea.

Keywords: *integrated storage facility, mine waste storage, rugged terrain, high rainfall, high seismicity, Frieda River Copper-Gold Project, policy framework*

1 Introduction

Repurposing of mine infrastructure can have strategic importance to all stakeholders – namely the mine owners, the host governments and the impacted communities. It can create new economic opportunities during and after the life of a mine. Closing a mine is generally a very complicated and costly process with no clear definition of when a mine is officially considered closed. It also requires a comprehensive policy framework to deal with any impacts and liabilities at closure. Hence, there is also a growing trend where mines are put on an indefinite phase of care and maintenance at cost without explicitly closing them. Nevertheless, these mines could have found a new lease in life if they had been preplanned to repurpose and relinquish some of their infrastructure for new opportunities. Fortunately, the sustainability demand on mining is encouraging new government policies that require mine developers to submit mine closure plans that include the possibility to repurpose and relinquish some of their infrastructure to the state or other stakeholders at the end of the mine life.

In many underdeveloped and developing countries, basic infrastructure required for servicing a mining operation is barely available. Such infrastructure includes that for energy, transportation, housing, welfare and health, education and training of the labour force, and even community policing. The cost of building such infrastructure is often so prohibitive that even the most promising mineral deposits become uneconomical to develop. In the case where it is decided to turn a promising deposit into a mine under these circumstances, the mine developers must commit to developing and maintaining an entire system of

[*] Corresponding author. Email address: david.saiang@ltu.se

infrastructure to service the mine on their own. Some of this infrastructure is very strategic for the development of a nation, especially the energy infrastructure. However, governments on the other hand often lack the capacity to partner in the development of tis infrastructure in order to take advantage of it during and after mining operations. Nevertheless, there is an increasing demand for governments to partner in infrastructure development, as part of the stakeholder contributions, with the aim to eventually repurposing the infrastructure and ultimately take over the ownership. On the other hand, any plans to repurpose and relinquish mining infrastructure for post-mining usage will require a clearly guided policy framework as liabilities are part of any transfer of mining infrastructure.

Xstrata PLC, the previous manager of the Frieda River Copper-Gold Project (FRCGP) in Papua New Guinea (presently managed by PanAust Ltd), introduced the concept of an 'integrated storage facility' (ISF) to deal with one of the most difficult issues of managing mine waste and creating energy to power the potential mine. The idea behind the ISF is to create a large man-made lake that will serve primarily as a marine environment for subaqueous storage of mine wastes (tailings and waste rocks) with excess cover water used in generating hydroelectricity to power the mine. The ISF concept was interesting enough that it attracted two regional governments from where the project is located to form a consortium called the Sepik Development Project (SDP) to partner in the greater hydro-electric project, referred to as the Frieda River Hydro-Electric Project (FREHP).

The concept of the ISF, even though ambitious and innovative, will be the first of its kind if eventually realised. However, for the moment, it has also attracted controversy due to the many risks that are to be comprehensively researched and advanced with sound engineering. Saiang et al. (2020) highlighted the basis behind the ISF concept, and the challenges and the risks involved. While it requires a comprehensive policy framework to guide the development and execution of such as infrastructure, various stakeholders and independent experts are presently fully engaged in the evaluation processes.

2 Background

Since its discovery in the 1960s, the Frieda River copper-gold deposit remains one of the largest known copper-gold deposits that is yet to be developed. The deposit lies along the famous New Guinea Mobile Belt, home to some of the world's largest copper and gold deposits including Ertsberg, Grasberg, Ok Tedi, Porgera, Wafi-Golpu, Lihir and Panguna, to name a few (Figure 1).

Figure 1 Copper-gold deposits of the New Guinea Mobile Belt (www.niuminco.com.au)

The New Guinea Mobile Belt is a tectonic belt that stretches through the middle of the island of New Guinea and is part of the greater Pacific Ring of Fire. It is a seismically active zone that comprises 5–10% of the world's total earthquakes (Brooks 1963). The region is also known for very steep rugged terrain with razor-sharp ridges and vertical rock cliffs, thick tropical jungles and swamps, high rainfall (3,000 to 10,000 mm per year),

fast-flowing rivers, pristine wildlife, and native inhabitants with diverse culture and heritage. The ambitious construction of Ertsberg and Ok Tedi in the 1970s and 1980s, respectively, by Bechtel Engineering highlights the enormous engineering undertaking to access the valuable resources of New Guinea at the cost of billions of dollars. The estimated price tag for the construction of the Frieda River copper-gold deposit stands at more than USD 8 billion today.

The increase in awareness of the risks posed by mining activities has resulted in all stakeholders (local populations, local and national governments, and resource developers) to actively participate in new mineral resource development projects. For the last 10 years, the FRCGP and its current principal owner, PanAust Ltd, have been actively engaged in detailed feasibility studies that involved input from all stakeholders. One of the major projects in these feasibility studies concerned the mine waste and tailings management system, the ISF. The proposal is to build a massive water storage infrastructure or dam to serve two functions: (i) as a submarine environment for subaqueous storage of mine waste and tailings and (ii) to generate hydro-electric power for the mine and the region. This facility, with a total areal occupation of 12,700 hectares, is planned to hold over 2 billion cubic metres of waste rock and tailings that will be produced over the life of the mine, and 0.04 billion cubic metres of water as cover for mine waste and power generation. The facility will be the core asset that will determine whether the resource will be developed or remain further undeveloped.

Although the concept of the ISF is innovative, it is seen as an ambitious undertaking by some observers, with significant risks to be addressed. The uncertainty in the concept is very significant since it is a first of its kind. There exists no such facility of this magnitude neither in Papua New Guinea nor the Southern Hemisphere. The inherent climatic, topographical, seismological, environmental, and socio-economic risks are to be carefully evaluated. Various stakeholders and independent experts are presently engaged in the evaluations.

3 Frieda River projects

The Frieda River projects will comprise two key projects, the FRCGP and the Frieda River Hydro-Electric Project (FRHEP). The FRCGP will be involved directly in the development and operation of the Frieda River copper-gold deposit, while the FRHEP will be involved in the development of the hydro-electric project. The two key projects are described in the following subsections.

3.1 Frieda River Copper-Gold Project

The Frieda River copper-gold deposit comprises the main high-grade Nena deposit and several satellite deposits (Horse, Ivaal, Koki and Ekwai). The maximum distance separating the deposits is roughly 6 km. They will ultimately be integrated into a super pit called the HITEK open pit (Figure 2). Potentially 3.0 billion cubic metres of rock will be excavated in the process. The current total resource estimate for the Frieda River deposit is 2.6 billion tonnes containing 13 million tonnes of copper and 20 million ounces of gold. With these resource tonnages, it can sustain a mine life of up to 40 years or more with estimated yearly production of 40 million tonnes, excluding waste. The FRCGP will be the operator of the mine. PanAust is the present project manager and principal investor. The Papua New Guinea government and other local and national stakeholders can exercise the right of up to 30% ownership through equity financing and royalties.

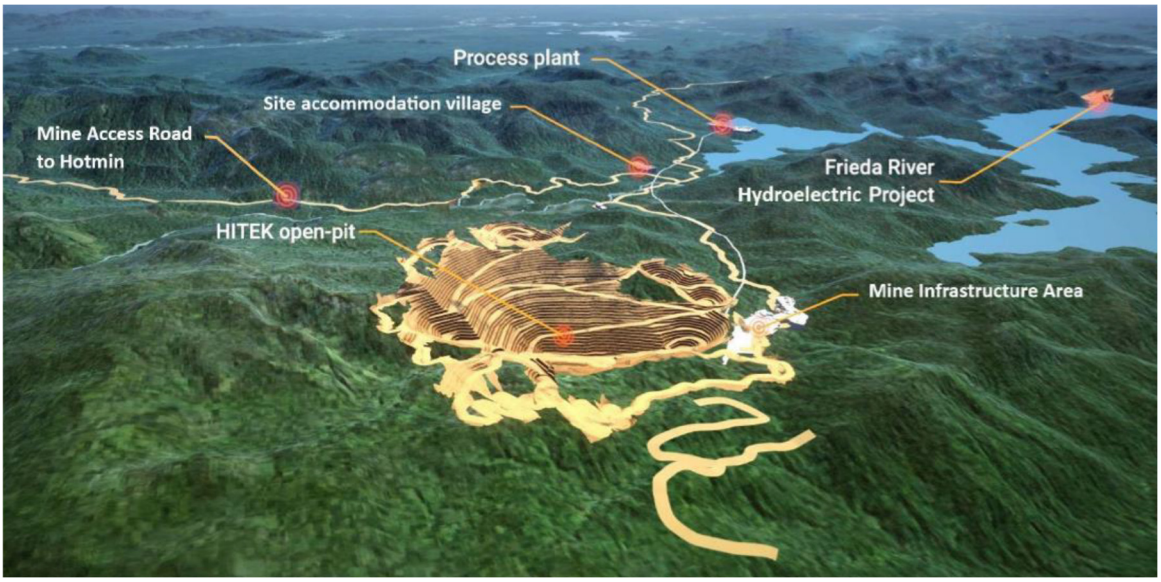


Figure 2 Architect's perspective of the ultimate Frieda River super pit (HITEK) and the relevant mine infrastructure (Coffey 2018a)

3.2 Frieda River Hydro-Electric Project

The FRHEP will comprise the following key infrastructure:

- the ISF
- the hydro-electric power generation plants
- the transmission lines.

Figure 3 shows the scope of the FRHEP. The FRHEP is a joint venture project between FRCGP, the SDP and the Papua New Guinea Government. The FRCGP will be the operating company for the Frieda River copper-gold mine, while the FRHEP will focus on power generation.

The FRHEP will operate independently to generate electricity for the mine as well as manage the distribution of excess electricity for regional use and export. The FRHEP is expected to generate c.a. 600 MW of electricity, of which the 300 MW will be consumed by the FRCGP. This means an excess of 300 MW is available for distribution for regional and national consumption. Presently, the total amount of electricity generated in Papua New Guinea amounts to approximately 780 MW. This means that the FRHEP will practically double the nation's total electrical energy generation. Being strategically located along the spine of the country (Figure 1) the FRHEP has strategic importance to the country's development of the national energy grid which is currently in the planning state by the national government. The FRHEP has the potential to power the other up-coming mines such as Wafi-Golpu and Yandera, and even the existing ones such as Porgera, Ok Tedi and K92 for their additional energy needs.

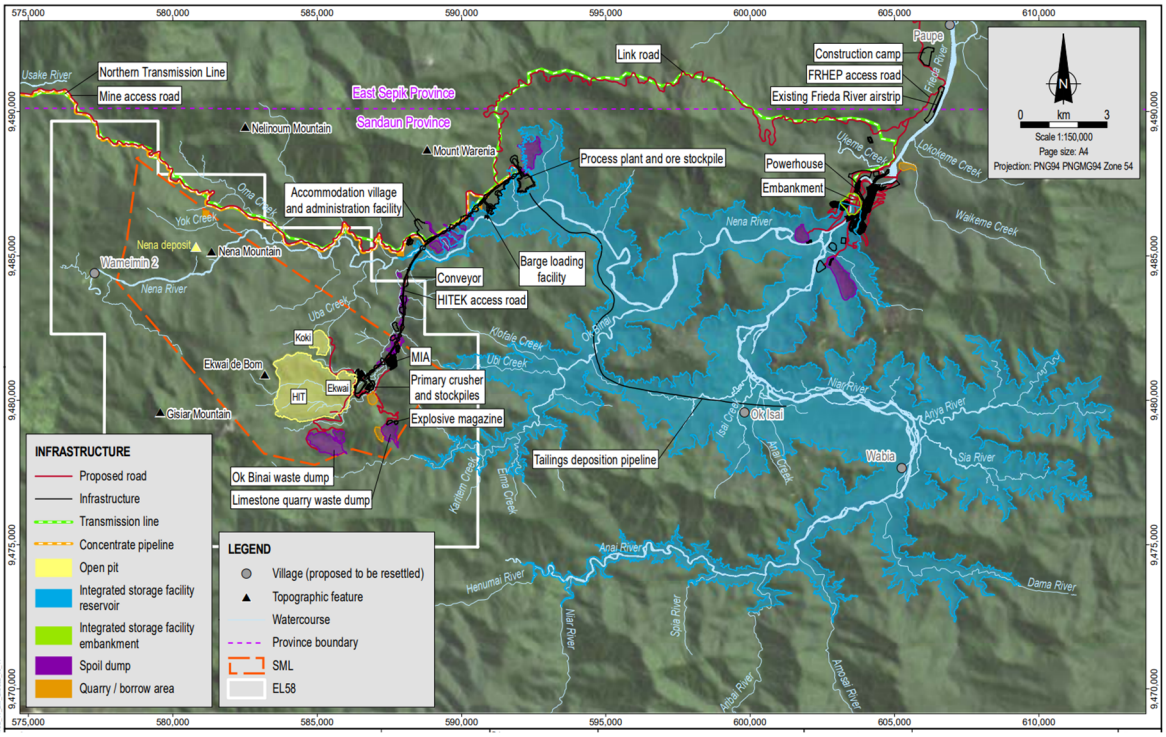


Figure 3 The scope of the Frieda River Hydro-Electric Project (Coffey 2018b)

3.3 Integrated storage facility

The ISF is the key component of the FRHEP. The ISF itself is planned to be a large man-made lake that will serve primarily as a marine environment for subaqueous storage of mine wastes (tailings and waste rocks), with excess cover water used to generate hydroelectricity (Figure 4). The key components of the ISF will consist of the large reservoir occupying an area of 12,700 hectares, the dam embankment, hydro-power infrastructure, and mine waste and tailings handling systems. The ISF will comprise approximately 75% of the FRCGP footprint. More than 2 billion cubic metres of waste rock (crushed and screened) and tailings (pretreated) will be deposited in the reservoir over the life of the mine. Approximately 0.04 billion cubic metres of cover water will be maintained in the reservoir to serve as an oxidation barrier. The ISF is designed to continuously discharge excess water, since the area receives on average 8,000 mm of rainfall per year and sudden inrushes from feeder streams. The ISF is designed to last for 200 years. After the mine closure at the end of 35–40 years, the ISF is planned to be fully relinquished to the FRHEP. However, a policy framework is required for guiding the transfers and the post-mining operation and maintenance. This policy framework is currently being studied for submission to the national government.

According to the FRCGP owners, the ISF is the key core asset that will determine whether the Frieda River deposits will be developed or remain further undeveloped. However, the safety of the ISF remains one of the most controversial issues among the stakeholders and freelances. Even though PanAust Ltd presently operates a similar facility at its Phu Kham mine in Laos, that facility does not generate hydro-power as a secondary purpose. The sites and sizes of these two projects are drastically different, with the eventual Frieda River ISF several magnitudes larger than Phu Kham. Nevertheless, ongoing independent studies are being conducted with specific focus on the safety of the ISF (e.g. Saiang et al. 2020).

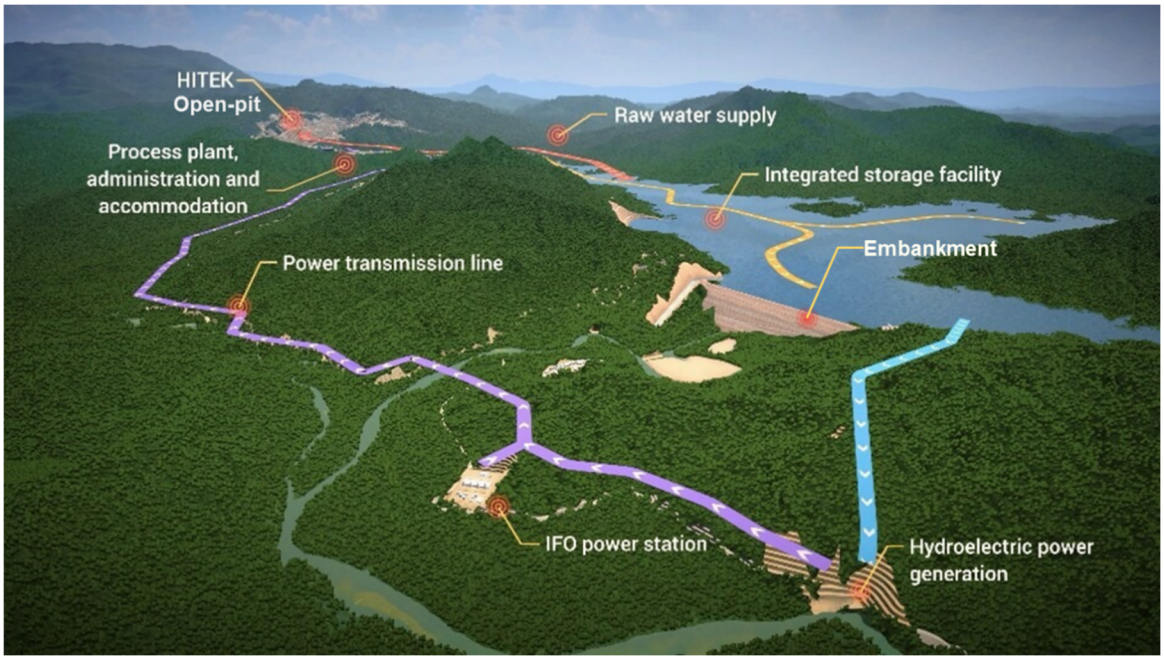


Figure 4 The ISF will consist principally of the reservoir under which tailings and waste rock will be stored, and access cover water for power generation and its related infrastructure (Coffey 2018b)

3.4 Safety, risks and challenges

3.4.1 Geological hazard

The ISF will be located on a site of substantial geological hazards, both locally and regionally. Local geo-hazards include tens of metres of highly weathered bed rock, soil and colluvium, dominated by landslip scarps. Douglas Partners (2009) noted that 60–80% of the area within the ISF consists of liquefiable soil and colluvium. If buried under water, these materials will dramatically lose their cohesive strength, and the risk of sudden liquefaction becomes too high. The risk is exacerbated if the mine wastes are bedded on these materials. The ISF will also sit on top of a series of thrust faults, one of which was the epicentre of the most recent magnitude 4.2 earthquake that occurred in 2015 at a depth of 43 km within the fault. The faults in this area are seismically active.

Hydro-power reservoirs can also induce earthquakes. The most powerful earthquake thought to have been induced by a reservoir is a magnitude 6.3 tremor within the Koyna hydro-power dam in India in 1967. It devastated one village, killed hundreds of people, injured thousands and rendered thousands homeless (Chopra & Chakrabarti 1973).

3.4.2 Seismic hazard

The Global Seismic Hazard Assessment Program (GSHAP) identifies the area of the Frieda River ISF as a moderate hazard with peak ground accelerations (PGAs) between 1.6 and 2.4 m/s^2. The Frieda River ISF is designed for PGA of up to 10.69 m/s^2 with an operational PGA of 3.8 m/s^2. Analyses of a series of dam break scenarios were conducted to arrive at these PGAs (SRK Consulting Australasia 2018). However, in February 2018 a magnitude 7.5 earthquake with a PGA of 3.2 g or 31.39 m/s^2 was registered (United States Geological Survey [USGS] 2018), with the epicentre located roughly 200 km southeast of the Frieda River project site. Ground failures resulting from the tremor were reported at the Ok Tedi mine, located about 210 km from the epicentre. Then, in April 2023, a magnitude 7.0 earthquake with an epicentre located c.a. 150 km east of the Frieda River projects was recorded (USGS 2023). This event caused significant ground deformations in areas surrounding the Frieda River project site with damages observed regionally. The event that placed the Frieda River project site within its epicentre is the 1935 magnitude 7.8 earthquake (USGS 1935). In May 2016, a magnitude 7.9 earthquake, with the epicentre located only tens of kilometres from the Lihir mine (USGS

2016), sent tsunami waves into Lihir Island causing the mine to temporarily halt operation as a precautionary measure. In 2011, a magnitude 7.1 earthquake within the proximity of the Hidden Valley mine (USGS 2011) caused the mine to suspend mining for a day to stocktake for damages. Mines in Papua New Guinea are prone to earthquakes with magnitudes greater than 7.0, with PGAs potentially greater than the operating PGA of mine infrastructure. All mines generally take precautionary measures when large earthquakes occur within their proximities.

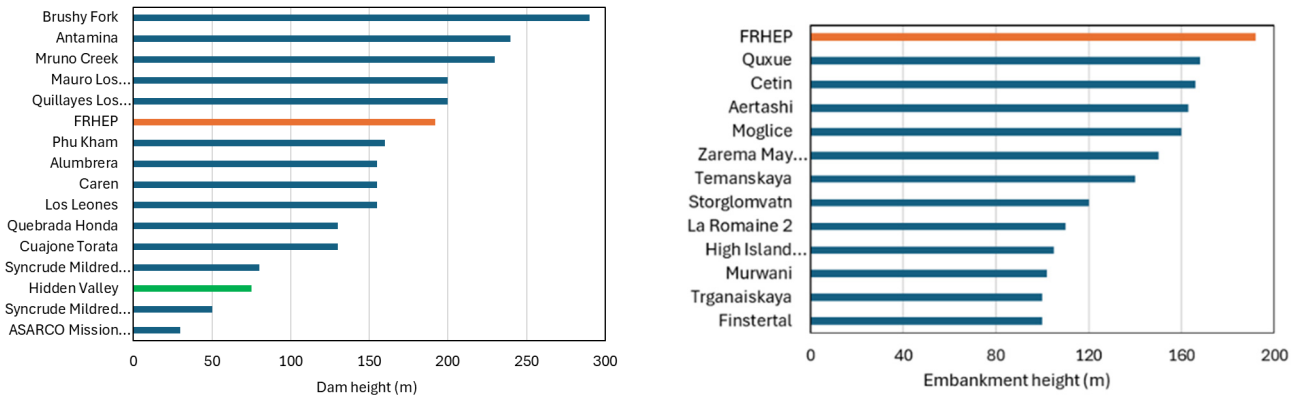
3.4.3 Rainfall

The Frieda River ISF will be located in one of the wettest places on Earth. It will experience an average rainfall of 8,000 mm annually. In terms of wettest tailings dams worldwide, the current record is 4,000 mm, in Hidden Valley mine, also in Papua New Guinea. If the Frieda ISF comes into operation, then it will hold the record for being the wettest mine waste and tailings dam infrastructure in the world.

The risk culminating from rainfall cannot be underestimated. Flooding, erosion and sedimentation resulting from heavy rainfall will undermine the safety of the ISF. The recent changes in global weather patterns have seen frequent occurrence of prolonged wet and dry seasons in Papua New Guinea. Historical weather patterns of the last 50–100 years are no longer reliable, the impact of which needs to be studied thoroughly. The year-long drought experienced in Papua New Guinea between 2015 and 2016 led to the suspension of the massive Ok Tedi mine, when the reliable Fly River turned into dry sandy banks, grounding barges from transporting ore and supplies to and from the mine. A drought is a likely scenario and is obviously a significant risk to the ISF. Lowering of the water level at the ISF will risk exposing the toxic mine waste to oxidisation. Hydro-power generation would also be interrupted.

3.4.4 The structural safety of the integrated storage facility

One of the biggest challenges is the structural safety of the ISF. At 192 m, the embankment for the Frieda River ISF or for the FRHEP will be among the tallest in the world (Figure 5a). In terms of asphalt core rockfill dams, it will be the tallest (Figure 5b). An asphalt core rockfill dam is more suitable for areas of high seismic activity where a traditional clay core rockfill dam may not perform well. It also promotes flexibility, resistance to cracking and the ability to self-heal small leaks.



(a) (b)

Figure 5 (a) Embankment height of other tailings dams compared to the Frieda River Hydro-Electric Project (FRHEP); (b) Embankment height of other asphalt core rockfill dams compared to the FRHEP (SRK Consulting Australasia 2018)

The Frieda River ISF is unique in that it is designed to serve as a dual-purpose infrastructure, for mine waste storage and for hydro-electric power generation. The ISF's designers have consulted various international standards, among them respectable ones such as the International Committee on Large Dams (ICOLD), Australian National Committee on Large Dams (ANCOLD), Canadian Dam Association (CDA) and US Army Corps of Engineers (USACE). However, the designers admitted that some design elements from the

mentioned standards are limited since the ISF is neither a conventional hydro-power dam nor a conventional tailings dam.

Four key life cycle stages have been identified to ensure the safety of the ISF (Saiang et al. 2020): (i) design stage, (ii) construction stage, (iii) operational stage, and (iv) closure stage. Flaws in each of these stages would significantly impair the full functionality of the infrastructure and thus jeopardise its safety. A high-level review panel was established by PanAust Ltd under its stewardship program for mine waste management to review the design of the ISF. The panel made several recommendations for further improvement to the ISF design and its individual components. Recommendations were also made for the steps to be observed during construction, operation and closure of the ISF, including monitoring and quality assurance procedures.

3.4.5 Dam break consequences

Considering the significant risk in the ISF embankment, the consultants (SRK Consulting Australasia 2018) resorted to a risk–consequence-based design approach. This meant back-engineering the design to reduce the consequences in the event of failure. SRK used the criteria established by ICOLD and ANCOLD to undertake a dam break analysis for an informed design based on the consequence categories of different dam break scenarios. The result of this analysis is shown in Table 1, which shows the severity being divided into four categories: minor, medium, major and catastrophic. The Frieda River ISF embankment falls under the category of 'extreme consequence' or 'high catastrophic' in the event of a failure. Even though the risk of dam failure is low, as per the design for 200 years, the consequence is still at a catastrophic level.

Table 1 Consequence category. Frieda River ISF embankment category is highlighted (SRK Consulting 2018; ANCOLD 2012)

Population at risk	Severity of damage and loss			
	Minor	Medium	Major	Catastrophic
<1	Very low	Low	Significant	High C
≥1 to <10	Significant	Significant	High C	High B
≥10 to <100	High C	High C	High B	High A
≥100 to <1,000	–	High B	High A	Extreme
≥1,000	–	–	Extreme	Extreme

4 Regulatory, policy framework and social license to operate

The independent state of Papua New Guinea promotes sustainable development of its resources through various policies. This is supported by a legislative and policy framework, which ensures that approved developments assess, reduce and manage residual environmental and social impact. It is a government priority and constitutional requirement to ensure that the people of Papua New Guinea benefit from the development of their resources in a sustainable, environmentally responsible and socially acceptable manner.

Furthermore, having a clear regulatory and policy framework is essential for defining the type of mining infrastructure, permits applicable, liabilities involved and whether an infrastructure is transferable or non-transferable. Since the Bougainville/Panguna mine crises in the 1990s, the government of Papua New Guinea has worked on developing comprehensive regulatory and policy framework for mining, environment and social-economic benefits. Recently, in the mid-2000s, the government has introduced even more comprehensive policy framework for mine infrastructure development, stakeholder participation and social licence to operate in conformity with standards such as the International Finance Corporation's (IFC) *Standard on Social and Environmental Assessment and Management Systems* (IFC 2012).

4.1 Policy framework for the Frieda River Copper-Gold Project and the Frieda River Hydro-Electric Project

The key pieces of legislation relevant to the development of the FRCGP and the FRHEP are the *Environment Act 2000* (Conservation Environment Protection Authority [CEPA] 2002) and the *Mining Act 1992* (Mineral Resources Authority 2012; Mineral Resources Authority & Department of Mineral Policy and Geohazards Management 2015). The legislations cover the development, operation and closure of the infrastructure. The *Mining Act 1992* is presently the principal regulatory document governing the mining industry and associated infrastructure supporting mine operation such as dams in Papua New Guinea. The rights to explore for, mine and sell mineral resources are granted in the form of tenements. The FRHEP is likely to operate under a lease for mining purposes (LMP), which is required to construct and operate the ISF. The LMP tenements granted under the provisions of the *Mining Act 1992* will revert to the state on relinquishment. It is proposed that the FRHEP will be transferred to a state lease on closure of the FRCGP. The *Environment Act 2000* provides the administrative mechanism to evaluate impacts on the environment through an environmental approval and permitting system under CEPA. The SDP (including the FRHEP) has been deemed a level three activity under the *Environment (Prescribed Activities) Regulation 2002* (CEPA 2002), for which an environmental impact statement is required for assessment.

4.2 Community engagement and social license to operate

Since the Panguna mine crises of the 1990s and the devastating effect of the Ok Tedi mine on the Fly River system, Papua New Guineans are very aware and sensitive to any mining development activities and their potential impact. The FRCGP and the ISF/FRHEP will be located at the headwaters of the Sepik River (Figure 6), which is one of the largest rivers in Papua New Guinea with a vast catchment area of over 100,000 km^2. A vast majority of the population of the East Sepik province is concentrated along the Sepik River system and depends on its waterways for their daily livelihood and nourishment. Hence, any disposal of mine waste into the Sepik River system and its catchment areas, or even the ISF dam break scenario, will have a devasting effect. An overview of the conflicts and basis for marine disposal of mine wastes in Papua New Guinea is described in Saiang et al. (2020).

Over the last 20 years, the developers and stakeholders of the FRCGP and FRHEP, along with the national government, and freelances have engaged themselves on roadshows to publicly engage the stakeholder populations about the projects. The public engagement is in line with the IFC's *Performance Standard on Social and Environmental Assessment and Management Systems* (IFC 2012). At this point, the projects have created controversial viewpoints – some for and others against. However, the government and the project owners are determined and are continuously engaging both national and international professionals to provide expert guidance on the project development, impact and consequences.

(a) (b)

Figure 6 (a) Frieda River projects lie in the catchment area of the Sepik River system; (b) Public engagement of the local population regarding the Frieda River projects (Saiang et al. 2020)

5 Closure process

The closure process for the FRCGP and the FRHEP are considered critical and therefore the project owners have already begun engaging themselves in the closure process within the scope of the feasibility studies. The actual closure will begin within the scope of the design phase. This will allow for the identification of infrastructure that is transferable, so that it can be aligned with the goal of relinquishment. The closure process shown in Figure 7 is used by the planners of the FRCGP and the FRHEP.

The FRCGP will evolve in four key phases: (i) design and construction, up to 6 years, (ii) operation, 35–40 years, (iii) decommissioning and closure, 2–3 years, and (iv) monitoring and maintenance (unknown period). The FRHEP will immediately begin construction in parallel with construction of the FRCGP. The construction of the ISF is estimated to take 6–8 years. The construction of other infrastructure associated with the FRHEP will also occur in parallel with the ISF. During the operation phase, the ISF is planned to operate for 100 years before it can be decommissioned. However, power generation will continue for at least 200 years according to the proposed design (SRK Consulting Australasia 2018).

A comprehensive closure plan has been put together by the planners of the FRCGP and the FRHEP. These closure plans can be found in Coffey (2018c, 2018d). Furthermore, PanAust Ltd has developed a sustainability framework for the FRCGP in accordance with the International Council on Mining and Metals Sustainable Development Framework (of which PanAust Ltd is a signatory) to guide the development, operation and closure of the FRCGP. Of significant importance is the ISF. An ISF stewardship framework has been put in place by PanAust Ltd, even though it is still unclear how it will be implemented.

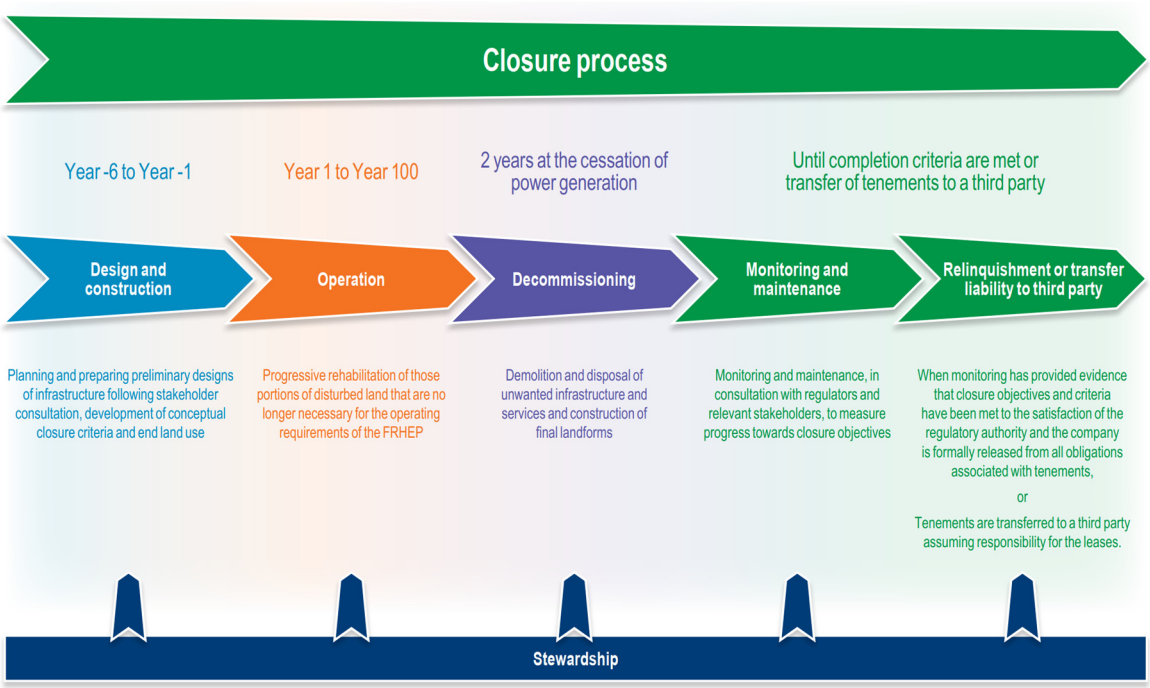


Figure 7 Closure concept for the Frieda River Copper-Gold Project and the Frieda River Hydro-Electric Project (Coffey 2018d)

6 Conclusion

The repurposing and relinquishing of mine infrastructure after mine closure is a complex process as this paper demonstrates for the Frieda River Copper-Gold and Frieda River Hydro-Electric projects in Papua New Guinea. The task requires a comprehensive regulatory and policy framework. There are risks and liabilities involved, and they are part of the package when mine infrastructure is transferred either to the state or other stakeholders. Any plans to transfer any part of mine infrastructure at the end of the mine life must begin during the mine planning and design phase. This will allow for development of the policy framework that will

facilitate the transfer, while also addressing all the necessary safety and risk issues. This policy framework should include processes for establishment of financial surety, bonds and trusts to cover the cost of rehabilitation and ongoing management of the site in perpetuity after operations cease.

The concept of the ISF presented in this paper is an interesting one, but it requires extensive investigations, design studies, risk evaluations and policy guidelines before it can be realised. A major challenge for the Frieda River ISF designers is that the ISF is neither a standard tailings dam nor a hydro-power dam, making it difficult for benchmarking. The Frieda River ISF is intended to host the mine wastes in a subaqueous environment, while at the same time to facilitate the generation of hydroelectricity for the mine and for regional distribution. Since the ISF will eventually be repurposed to have a life (in perpetuity) beyond mine closure, a consortium known as Frieda Hydro-Electric Project or FRHEP was formed to be the project owner. The FRHEP is a partnership between the FRCGP, the national government and the two impact area regional governments. The FRHEP will comprise the ISF, the hydro-power generation plants and power transmission infrastructure. At the end of the mine life, the ISF and all its components are intended to be fully relinquished to the FRHEP.

Due to the risks and sensitivity of the FRHEP infrastructure, the stakeholders of the ambitious project have been engaged in ongoing consultation with communities, international consultants, professionals and freelancers to evaluate the risks and opportunities of the project. The FRHEP also falls in line with the national government's strategic planning for energy infrastructure in the country.

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